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PATENT & TRADEMARK OFFICE

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PATENT
Attorney Docket No.: SP00-038

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Bumgarner, Kirk P et al.	
Serial No:	09/733,352	Examiner: Hoffman, John M
Filing Date:	12/08/2000	Group Art Unit: 1731
Title:	Method and Apparatus for ensile Testing and Rethreading Optical Fiber During Fiber Draw	

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BRIEF ON APPEAL

This Brief supports the appeal to the Board of Patent Appeals and Interferences from the final rejection dated October 27, 2004, in the application listed above. Appellant filed the Notice of Appeal on January 27, 2005. Appellant now submits this Brief in triplicate, as required by 37 C.F.R. § 1.192(a).

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is Corning Incorporated.

II. RELATED APPEALS AND INTERFERENCES

With respect to the related appeals or interferences that will directly affect, or be directly affected by, or have a bearing on the Board's decision in this appeal, there are no such appeals or interferences.

III. STATUS OF CLAIMS

On January 27, 2005 appellant appealed from the final rejections of claims 1-14, 16-30, 33-37, and 59-60 which were rejected in the final Office Action dated October 27, 2004.

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Those are the pending claims that are the subject of this Appeal and are set forth in the attached Appendix.

IV. STATUS OF AMENDMENTS

There are no amendments that have not been entered by the Examiner. The last amendment to the claims was made in the Amendment and Response which was filed on May 14, 2004.

V. SUMMARY OF INVENTION

The present invention relates to a method and apparatus for conducting online tensile screening of optical fiber, particularly at high speeds. In a preferred embodiment, the fiber is tensile tested during fiber draw and wound directly onto a shipping spool to be shipped to a customer. The tensile stress can be imparted to the fiber during the draw process by feeding the fiber through a screener capstan, which works in conjunction with another capstan to impart the desired tensile stress to the fiber during the draw process. The fiber tension is monitored by a load cell, and the speed of one of the capstans is adjusted in response to feedback from the load cell to thereby maintain the desired tensile screening force on the fiber

VI. ISSUES

The issue presented for consideration in this Appeal is:

35 U.S.C. § 102

1) Whether claims 1, 13-16, 20, and 59-60 are patentable under 35 U.S.C. §102(b) as being anticipated by Knowles (U.S. Patent No. 4,148,218).

35 U.S.C. §103

2) Whether claims 1-3, 11, 13, 14, 16-22, and 36-37 are patentable under 35 U.S.C. §103(a) as being anticipated by Knowles (U.S. Patent No. 4,148,218) and claims 13, 11, 18-19, and 21-23 as being anticipated by Knowles (U.S.

Patent No. 4,148,218) in view of Bice (U.S. Patent No. 5,787,216).

VII. GROUPING OF CLAIMS

In compliance with 37 C.F.R. § 1.192(c)(5), Appellants state that all of the claims stand or fall together.

VIII. ARGUMENT

The rejection of claims 1, 13-16, 20, and 59-60 as being unpatentable under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,148,218 (Knowles) is improper

According to the Federal Circuit, "a prior art reference anticipates a patent claim if the reference discloses, either expressly or inherently, all of the limitations of the claim." EMI Group N. Am., Inc. v. Cypress Semiconductor Corp., 268 F.3d 1342, 1350 [60 USPQ2d 1423] (Fed. Cir. 2001)

Claim 1 requires that the tension between the capstans is monitored during the draw process via a load cell and that the speed of one of the capstans is adjusted in response to feedback from the load cell about the monitored tension. There is no mention or suggestion in any of the references cited of adjusting the speed of one or more capstans in response to feedback about the monitored tension from a load cell.

According to the Examiner:

> "the term "load cell" is not defined in the specification. Also, examiner did not find any mention of any particular load cell used. In fact, the drawings do not appear to show a load cell. Furthermore, Examiner could not find a definition for "cell" in a dictionary that would encompass Applicant's invention, but not the Knowles clutch. Since Applicant's cell and Knowles serve the same function (i.e. monitor tension so as to maintain tension) it is deemed that Knowles clutch is a "load cell"."

Applicants disagree, and submit that the Knowles clutch is not a load cell. As for the term "load cell" not being defined in the specification, it is well known that a load cell is a transducer used to measure force or weight. Load cells convert weight or force into electrical signals which can be used to actuate or drive a variety of measuring or control apparatus. An example of a reference showing a strain gauge load cell is submitted herewith. In particular, Mechanical Measurements, by T. G. Beckwith, pages 313-317, discuss strain gauge load

cells. According to the Examiner, "since applicants' cell and Knowles serve the same function (i.e. monitor tension so as to maintain tension) it is deemed that Knowles' clutch is a "load cell"." Applicants disagree, this is tantamount to saying that a car is a bicycle, as both of them serve the same function (transportation). It is clear that the Knowles clutch is not a load cell. Also, the term "clutch" is not defined in the specification of Knowles et al, and applicants can find no dictionary definition that would support the use of the word clutch to mean a load cell. Instead, applicants submit that a clutch is a device for engaging and disengaging two working parts of a shaft or of a shaft in a driving mechanism, or alternatively, the lever, pedal, or other apparatus that activates such a device (American Heritage Dictionary—see definition enclosed herewith).

According to the Examiner, "it is noted that the claims do not require the tension to be measured: in applicant's embodiment, the load cell would detect a force equal to twice the tension." Applicants disagree, and submit that Examiner's own comment indicates that tension is being measured (i.e., the load cell is measuring a force equal to twice the tension). Both of claims 1 and 20 clearly require that the fiber tension between the capstans is monitored during the draw process and the speed of one of the capstans is adjusted in response to the monitored tension to maintain a desired tensile screening force on the fiber. "Monitor" is defined in the American Heritage Dictionary as "to scrutinize or check systematically with a view to collecting certain specified categories of data" (see copy of definition enclosed). Even if, assuming arguendo, Examiner is correct in indicating that the load cell would detect a force equal to twice the tension, this is irrelevant, as even in this situation the fiber tension would be measured, albeit perhaps not entirely accurately. On the other hand, Applicants submit that even if the load cell did detect a force equal to twice the tension, in fact this would be an accurate measurement because the operator would know that this is the case and factor this inaccuracy into the process.

According to the Examiner, "alternatively, 29 is the load cell." Applicants submit that this interpretation of Knowles likewise does not rise to the level of anticipation, as nowhere in Knowles is a load cell used to monitor fiber tension during the draw process, wherein the speed of one of the capstans is adjusted in response to feedback from the load cell about the monitored tension to thereby maintain a desired tensile screening force on said fiber.

Claims 1 and 20 both require that the tension in said fiber between said screener capstan and said another capstan is monitored and the circumferential speed of said screener capstan is adjusted in response to said monitored tension. As mentioned above, "monitor" is defined in the American Heritage Dictionary as "to keep track of by or as if by an electronic device" or "to scrutinize or check systematically with a view to collecting certain specified categories of data". Page 10, lines 26-29, of applicants' specification indicates that "turn around pulley 22 is connected to a load cell which monitors the amount of tension applied onto the turn around pulley by the passing fiber, and thus monitors the amount of tension being imparted to the fiber." Similarly, page 11, lines 7-9, indicate that "Feedback from the load cell of the turn around pulley 22 is used to adjust the differential speed of the screening capstan 24 so that a sufficient screening tension is maintained consistently throughout drawing of the entire optical fiber blank into optical fiber." Thus, clearly, in applicants' case, an electronic device keeps track of the tension, and collects information about the tension which is then used to adjust the circumferential speed of said screener capstan, depending on whether the tension is too high or too low. Consequently, it is clear that, as the Examiner himself indicated on page 3 of his Final Rejection dated October 27, 2004, Knowles device does not "monitor" the tension as that term is employed in applicants' specification and claims. Knowles also does not disclose adjusting the speed of a capstan in response to feedback from the load cell about the monitored tension to maintain a desired tensile screening force on the fiber.

Claim 16 requires that the load cell be connected to the pulley. There is no mention or suggestion in Knowles of a load cell connected to a pulley. According to the Examiner, "33 of Figure 2 of Knowles is the pulley which is connected (via 11) to the load cell". Applicants respectfully disagree and submit that if this were the case, then every component of every machine in the world is connected (via air, water, continents or whatever atmosphere or parts are needed to complete the connection). As explained above, Page 10, lines 26-29, of applicants' specification indicates that "turn around pulley 22 is connected to a load cell which monitors the amount of tension applied onto the turn around pulley by the passing fiber, and thus monitors the amount of tension being imparted to the fiber." Similarly, page 11, lines 7-9, indicate that "Feedback from the load cell of the turn around pulley 22 is used to adjust the differential speed of the screening capstan 24 so that a sufficient screening tension is maintained consistently throughout drawing of the entire optical fiber blank into

optical fiber." Thus, it is clear from applicants' specification that the pulley must be operatively connected to the load cell so that the load cell can monitor tension of the fiber via contact with the pulley.

Claims 59 and 60 require that the monitoring be done electronically. It is submitted that none of the prior art references, alone or in combination, describe electronic monitoring of the tension at load cell and adjusting in response to feedback from a load cell. According to the Patent Office, claims 59-60 are clearly met. Applicants cannot understand this rejection at all as electronic monitoring does not appear to be mentioned in Knowles.

For at least the reasons given above, Appellants assert that the Examiner has failed to make a case of anticipation, and that the Board should reverse the §102 rejection and find that claims 1, 13-16, 20, and 59-60 are allowable over the prior art of record.

§ 103 Rejections

Applicants respectfully traverse the Examiner's rejection of claims 1-3, 11, 13, 14, 16-22, and 36-37 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,148,218 (Knowles).

A proper *prima facie* showing of obviousness requires the examiner to satisfy three requirements. First, the prior art relied upon, coupled with knowledge generally available to one of ordinary skill in the art, must contain some suggestion which would have motivated the skilled artisan to combine references. See In re Fine, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). Second, the examiner must show that, at the time the invention was made, the proposed modification had a reasonable expectation of success. See Amgen v. Chugai Pharm. Col, 927 F.2d 1200, 1209, 18 USPQ2d 1016, 1023 (Fed. Cir. 1991). Finally, the combination of references must teach or suggest each and every limitation of the claimed invention. See In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970).

According to the Patent Office, "As an alternative to the above discussion: Knowles doesn't disclose the type of clutch. In accordance with the basic laws of physics: one realizes that if one changes power transfer of a clutch (as Knowles discloses), since the total amount of supplied torque is constant, one would want to use a clutch which will change the velocity of the capstan, because one cannot change the power without an inherent change in the velocity." Applicants respectfully do not understand the point the Examiner is trying to

make. As far as applicants are aware, nowhere in any of applicants claims is a clutch being claimed, yet the Examiner seems to be indicating that it would be obvious to use a clutch in view of Knowles. Just to clarify, applicants are not claiming to have invented a clutch which will change the velocity of the capstan, nor is applicant claiming a clutch that changes the slippage rate when one changes the power output. As mentioned above, Knowles does not mention or suggest adjusting the speed of one of the capstans and in response to feedback from the load cell about the monitored tension.

Applicants also disagree with the Examiner's statement that Knowles doesn't disclose the type of clutch. It is clear from the teaching of Knowles that the clutch employed in Knowles is a conventional mechanical clutch and frankly do not understand how this point would be relevant. Is the Examiner indicating that one type of clutch is a load cell? As far as applicants are aware, there is no dictionary definition of clutch that would include load cells as an example.

With respect to claim 2, applicants disagree that it would have been obvious to draw the fiber as fast as possible so as to make as much fiber as possible. The Examiner has indicated that, once the fiber is pulled through the second tractor assembly, the speed of the tractor assembly is reduced causing the constant torque device to overload and the clutch to slip. Obviously, the faster one draws the fiber the more the clutch will slip, possibly and even probably to the point where if you pull it as fast as possible, as the Examiner suggests, then it will likely apply little or no torque at all to the optical fiber. Consequently, applicants submit that there would be no motivation to modify Knowles as proposed by the Examiner, and based on the Examiner's own comments, applicants believe that one skilled in the art would be motivated <u>not</u> to try to increase the draw speed, and that even if one of skill in the art were motivated to try this modification, there is no showing that such a modification had a reasonable expectation of success.

According to the Examiner with respect to claim 17, "It would have been obvious to have all of the features being connected and/or controlled by a computer so as to easily monitor the process variables, and to store the date so that one can go back and review what went wrong and what went right." Applicants submit that the statement by the Examiner is not mentioned or suggested at all by any of the references, and in fact the Examiner is merely stating the advantage of applicants' invention as defined by claim 17 and indicating that it would have been obvious, with no apparent motivation to make the modification proposed.

This is clearly a hindsight reconstruction by the Patent Office.

Applicants disagree that it would have been obvious to draw the fiber as fast as possible so as to make as much fiber as possible. The Examiner has indicated that, once the fiber is pulled through the second tractor assembly, the speed of the tractor assembly is reduced causing the constant torque device to overload and the clutch to slip. Obviously, the faster one draws the fiber the more the clutch will slip, possibly and even probably to the point where if you pull it as fast as possible, as the Examiner suggests, then it will likely apply little or no torque at all to the optical fiber. Consequently, applicants submit that there would be no motivation to modify Knowles as proposed by the Examiner, and based on the Examiner's own comments, applicants believe that one skilled in the art would be motivated <u>not</u> to try to increase the draw speed.

For at least the reasons given above, Appellants assert that the Examiner has failed to make a *prima facie* case of obviousness, and that the Board should reverse the §103 rejection and find that claims 1-3, 11, 13, 14, 16-22, and 36-37 are allowable over the prior art of record.

<u>The rejection of claims 4-12, 23-30, 33-35 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,148,218 (Knowles), and further in view of U.S. Patent No. 5,787,216 (Bice) is improper.</u>

According the Examiner, "Knowles does not disclose the ends being accessed for the optical testing. Bice, starting at column 1, line 26, discloses that one of the most important tests is OTDR which requires that the fiber be such that light travels from one end of the fiber (and back?). This requires that light be accessible to both ends of the fiber because it must travel to the second end if it is to reflect back from that end."

As applicants indicate on page 9, lines 14 through 18, "because the spool enables access to both ends of the fiber, optical and other testing can be conducted on the fiber which is stored upon spool 15 after the fiber draw and winding process, without having to remove the entire length of fiber from the spool or rethread the fiber onto a different spool." Thus, it is clear from applicants' specification that, by access, applicants mean that the tool must enable both ends of the fiber to be mechanically accessed. An example of such spool which will enable such access to both ends of the fiber is illustrated in Fig. 6, which of course the above description is directed to.

With respect to claim 33, none of the references disclose a device which monitors

tension via a load cell which is operatively connected to the fiber. With respect to claim 34, none of the references mention or suggest such a load cell which is connected to a pulley which in turn contacts the fiber, the fiber contact causing said pulley to rotate. With respect to claim 35, none of the references mention or suggest such a load cell which is connected to a pulley which in turn contacts the fiber, the fiber contact causing said pulley to rotate, and wherein a computer monitors said tension in said fiber via said load cell.

For at least the reasons given above, Appellants assert that the Examiner has failed to make a *prima facie* case of obviousness, and that the Board should reverse the §103 rejection and find that claims 4-12, 23-30, 33-35 are allowable over the prior art of record.

IX. CONCLUSION

In conclusion, Appellants request a reversal of each of the grounds of rejection maintained by the Examiner and prompt allowance of the pending claims 1-14, 16-30, 33-37, and 59-60.

Please charge the fees due under 37 C.F.R. § 1.17(c) to Deposit Account No. 03-3325. If there are any other fees due in connection with the filing of this Brief on Appeal, please charge the fees to our Deposit Account No. 03-3325. If a fee is required for an extension of time under 37 C.F.R. § 1.136 not accounted for above, such an extension is requested and the fee should also be charged to our Deposit Account.

Respectfully submitted,

Dated: March 28, 2005

By:

Robert L. Carlson
Registration No. 35,473
607-974-3502
Corning Incorporated
Patent Department
SP-TI-03-01
Corning, NY 14831

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Robert L. Carlson

APPENDIX TO BRIEF ON APPEAL

The·claims on appeal are as follows:

1. A method of screening an optical fiber during a fiber draw process, comprising pulling a length of optical fiber from an optical fiber preform imparting a tensile stress to said fiber to thereby test the strength of said fiber and subsequent to said imparting a tensile stress, winding said fiber onto a spool, wherein said tensile stress is imparted to said fiber via a first and second capstan, fiber tension between said capstans is monitored during the draw process via a load cell, and the speed of one of the capstans is adjusted in response to feedback from the load cell about the monitored tension to maintain a desired tensile screening force on said fiber.

2. The method of claim 1, wherein said fiber draw speed is greater than 20 m/s.

3. The method of claim 1, wherein said desired tensile stress is greater than about 95 psi.

4. The method of claim 1, wherein said fiber is wound onto a spool which enables access to both ends of said fiber while said fiber is retained on said spool.

5. The method of claim 4, further comprising, shipping said shipping spool with said fiber thereon to a customer.

6. The method of claim 2, wherein said fiber is wound onto a spool which enables access to both ends of said fiber while said fiber is retained on said spool.

7. The method of claim 2, wherein said fiber is wound onto said shipping spool in a manner which enables both ends of said fiber to be accessed while said fiber is stored on said spool.

8. The method of claim 4, wherein said fiber is wound onto said shipping spool in a manner which enables both ends of said fiber to be accessed while said fiber is stored on said spool.

9. The method of claim 5, wherein said method further comprising, prior to said shipping, conducting tests on said fiber while said fiber is on said spool.

10. The method of claim 9, wherein said tests include at least one test selected from the group consisting of optical time domain reflectometry, dispersion geometry and polarization mode dispersion.

11. The method of claim 2, further comprising conducting at least one optical property

test on said fiber while said fiber is on said shipping spool by a testing method which involves connecting one end of said fiber on said spool to a light source, and evaluating light which is launched from said light source and emitted from the other end of the fiber.

12. The method of claim 9, further comprising conducting at least one optical property test on said fiber while said fiber is on said shipping spool by a testing method which involves connecting one end of said fiber on said spool to a light source, and evaluating the light at the other end of the fiber.

13. The method of claim 1, wherein said second capstan is rotated at a higher circumferential speed than said first capstan to thereby impart said desired tensile stress.

14. The method of claim 13, further comprising adjusting the speed of said second capstan in response to said monitored tension, to thereby maintain said tensile stress.

15. (cancelled)

16. The method of claim 15, wherein said load cell is connected to a pulley which in turn contacts said fiber, said fiber contact causing said pulley to rotate

17. The method of claim 15, wherein a computer monitors said tension in said fiber via said load cell.

18. The method of claim 4, wherein less than 150 km of fiber is wound onto said spool.

19. The method of claim 4, wherein a length of fiber is wound onto said spool which is sufficiently short to enable the attenuation of said fiber to be measured while said fiber is on said spool.

20. A method of screening an optical fiber during a fiber draw process, comprising pulling a length of optical fiber from an optical fiber preform, imparting a desired tensile stress to said fiber to thereby test the strength of said fiber and subsequent to said imparting a desired tensile stress, winding said fiber onto a spool which is to be shipped to a customer or optical fiber cabling operation with said fiber thereon, wherein said imparting a tensile stress comprises feeding said fiber through a screener capstan which works in conjunction with another capstan which is in contact with said fiber to impart said desired tensile stress to said fiber during said draw process, and the tension in said fiber between said screener capstan and said another capstan is monitored and the circumferential speed of said screener capstan is adjusted in response to said monitored tension.

21. The method of claim 20, wherein said desired tensile stress is greater than about 80 psi.

22. The method of claim 20, wherein said desired tensile stress is greater than about 95 psi.

23. The method of claim 20, further comprising shipping said spool with said fiber thereon to a customer.

24. The method of claim 20, wherein said fiber is wound onto said spool in a manner which enables access to both ends of said fiber while said fiber is stored on said spool.

25. The method of claim 23, wherein said fiber is wound onto said shipping spool in a manner which enables both ends of said fiber to be accessed while said fiber is stored on said spool.

26. The method of claim 20, wherein said fiber is wound onto said shipping spool in a manner which enables both ends of said fiber to be accessed while said fiber is stored on said spool.

27. The method of claim 26, wherein said method further comprises, prior to said shipping, conducting tests on said fiber while said fiber is on said spool.

28. The method of claim 26, wherein said method further comprises, prior to said shipping, conducting tests on said fiber while said fiber is on said spool.

29. The method of claim 28, wherein said tests include at least one test selected form the group consisting of optical time domain reflectometry, dispersion geometry and polarization mode dispersion.

30. The method of claim 28, further comprising conducting at least one optical property test on said fiber while said fiber is on said shipping spool by a testing method which involves connecting one end of said fiber on said spool to a light source, launching light from said light source through said fiber, and evaluating said launched light at the other end of said fiber.

31. (canceled)

32. (canceled)

33. The method of claim 30, wherein said monitoring step comprises monitoring said tension via a load cell operatively connected to said fiber.

34. The method of claim 33, wherein said load cell is connected to a pulley which in turn contacts said fiber, said fiber contact causing said pulley to rotate.

35. The method of claim 34, wherein a computer monitors said tension in said fiber via said load cell.

36. The method of claim 20, wherein no more than 100 km of fiber is wound onto said spool.

37. (original) The method of claim 20, wherein a length of fiber is wound onto said spool which is sufficiently short to enable the attenuation of said fiber to be measured while said fiber is on said spool.

38-58 (cancelled)

59. The method of claim 1, wherein said tension is monitored electronically.

60. The method of claim 20, wherein said tension is monitored electronically.

MECHANICAL MEASUREMENTS

by

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and

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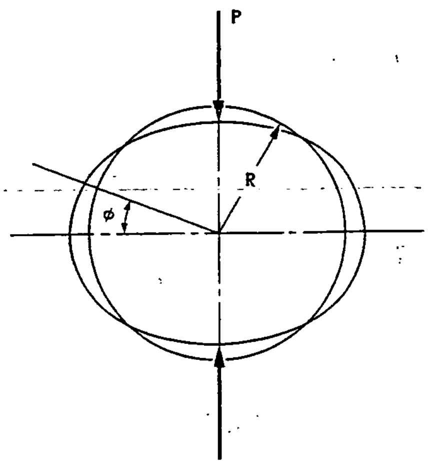

FIG. 11–8. Ring loaded diametrically in compression.

readings still will be obtained provided both zero and loaded readings are made by the same person. With 40 to 64 micrometer threads per inch, readings may be made to one- or two-hundred thousandths of an inch [5].

The equation given in Table 11–1 for circular rings is derived with the assumption that the radial thickness of the ring is small compared with the radius. Most proving rings are made of section with appreciable radial thickness. However, Timoshenko [6] shows that use of the thin-ring rather than the thick-ring relations introduces errors of only about 4% for a ratio of section thickness to radius of 1/2. Increased stiffness in the order of 25% is introduced by the effects of integral bosses [5]. It is, therefore, apparent that use of the simpler thin-ring equation is normally justified.

Stresses may be calculated from the bending moments, M, determined by the relation [6]

$$M = \frac{PR}{2}\left(\cos\phi - \frac{2}{\pi}\right). \tag{11–6}$$

Symbols correspond to those shown in Fig. 11–8.

(c) *Strain-gauge load cells.* Instead of using total deflection as a measure of load, the strain-gauge load cell measures load in terms of *unit* strain. Resistance gauges are very suitable for this purpose (see Chapter 10). One of the many possible forms of elastic member is selected, and the gauges are mounted to provide maximum output. If the loads to be measured are large, the direct tensile-compressive member may be used. If the loads are small, strain amplification provided by bending may be employed to advantage.

Figure 11–9 illustrates the arrangement for a tensile-compressive cell using all four gauges sensitive to strain and providing temperature com-

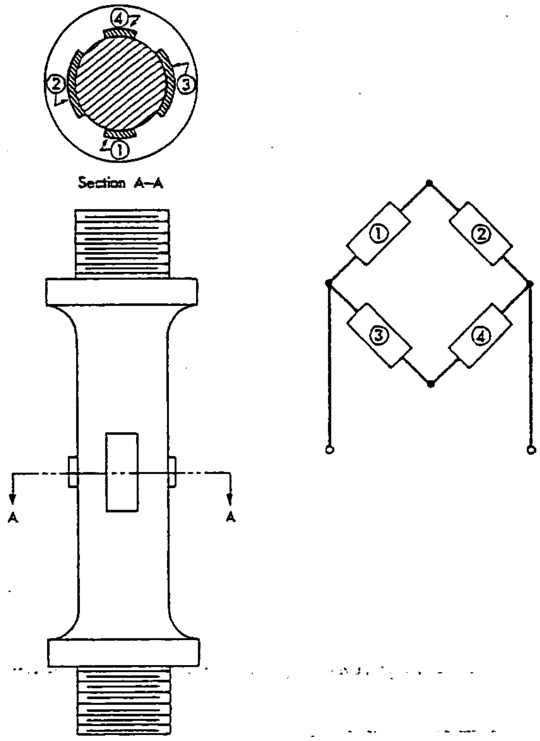

FIG. 11–9. Tension-compression resistance strain-gauge load cell.

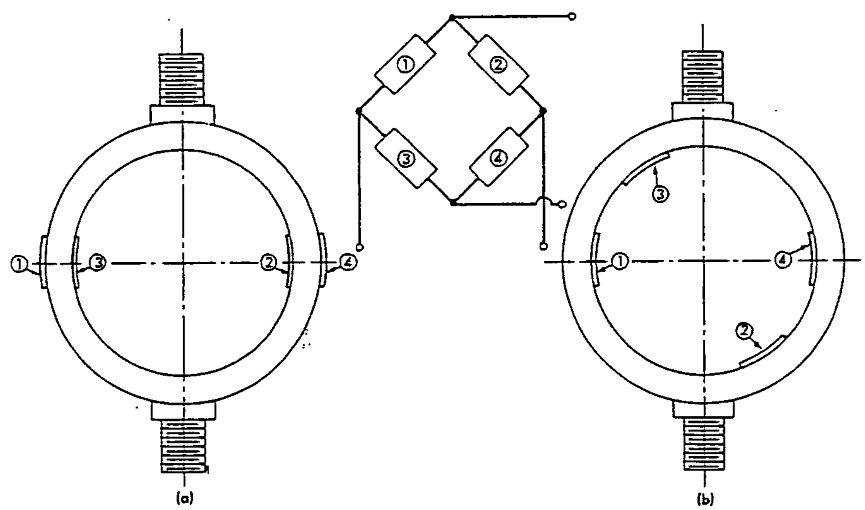

FIG. 11–10. Two arrangements of circular-shaped load cells employing resistance strain gauges as secondary transducers.

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pensation for the gauges. The bridge constant (Art. 10–9d) in this case will be $2(1 + \mu)$, where μ is Poisson's ratio for the material. Compression cells of this sort have been used with a capacity of 3 million pounds [8]. Simple beam arrangements may also be used, as illustrated in Figs. 10–13 and 10–34.

Figures 11–10(a) and (b) illustrate proving-ring strain-gauge load cells. In Fig. 11–10(a) the bridge output is a function of the bending strains only, the axial components being canceled in the bridge arrangement. By mounting the gauges as shown in Fig. 11–10(b), somewhat greater sensitivity may be obtained because the output includes both the bending and axial components sensed by gauges 1 and 4.

(d) *Temperature sensitivity.* The sensitivity of elastic load-cell elements is affected by temperature variation. This change is caused by two factors: variation in Young's modulus and altered dimensions, both brought about by temperature change. Variation in Young's modulus is the more important of the two effects, amounting to roughly $2\frac{1}{2}\%$ per 100°F. On the other hand, the increase in cross-sectional area of a tension member of steel will amount to only about 0.15% per 100°F change.

Obviously, when accuracies of $\pm\frac{1}{2}\%$ are desired, as provided by certain commercial cells, a means of compensation, particularly for variation in Young's modulus, must be supplied. When resistance strain gauges are used as secondary transducers, this is accomplished electrically by causing the bridge's electrical sensitivity to change in the opposite direction to the modulus effect [9]. As temperature increases, the deflection constant for the elastic element decreases; it becomes more *springy*, and deflects a greater amount for a given load. This increased sensitivity is offset by reducing the sensitivity of the strain-gauge bridge through use of a thermally sensitive compensating resistance element, R_s, as shown in Fig. 11–11.

As discussed in Art. 6–18d, the introduction of a resistance in an input-lead reduces the electrical sensitivity of an equal-arm bridge by the factor n, expressed as follows:

$$n = \frac{1}{1 + (R_s/R)}.$$

Requirements for compensation may be analyzed through use of the relation for the initially balanced equal-arm bridge, Eq. (6–44). If we assume

$$2\frac{\Delta R}{R} \ll 4,$$

Eq. (6–44) may be modified to read

$$\frac{\Delta e_o}{e_i} = \frac{k}{4}\frac{\Delta R}{R}.$$

This is true, particularly for a *strain-gauge bridge* for which $\Delta R/R$ is always small. A bridge constant, k, is included to account for use of more than one active gauge. If all four gauges are equally active, $k = 4$. For the arrangement shown in Fig. 11–9, $k = 2(1 + \mu)$, where μ is Poisson's ratio. If we account for the compensating resistor, the equation will then read

$$\frac{\Delta e_o}{e_i} = \frac{k}{4}\frac{\Delta R}{R}\left[\frac{1}{1 + (R_s/R)}\right]. \tag{11–7}$$

Rewriting Eq. (10–7),

$$\epsilon = \left(\frac{1}{F}\right)\left(\frac{\Delta R}{R}\right),$$

and from the definition of Young's modulus, E, Eq. (10–2),

$$P = EA\epsilon.$$

We may solve for sensitivity,

$$\frac{\Delta e_o}{P} = \left(\frac{e_i}{4}\right)\left(\frac{FRk}{A}\right)\left[\frac{1}{E(R + R_s)}\right]. \tag{11–8}$$

If it is assumed that the gauges are arranged for compensation of resistance variation with temperature and that the gauge factors F remain unchanged with temperature, and, further, that any change in the cross-sectional area of the elastic member may be neglected, then complete compensation will be accomplished if the quantity $E(R + R_s)$ remains constant with temperature.

Using Eqs. (6–20) and (6–28), we may write

$$E(R + R_s) = E(1 + c\,\Delta T)[R + R_s(1 + b\,\Delta T)], \tag{11–9}$$

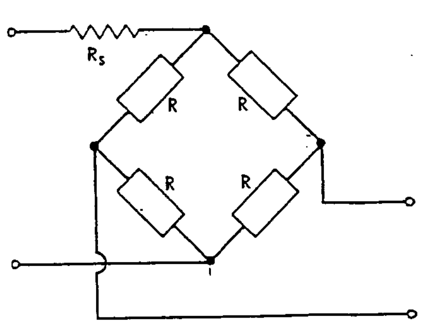

FIG. 11–11. Schematic diagram of a strain-gauge bridge with a compensation resistor.

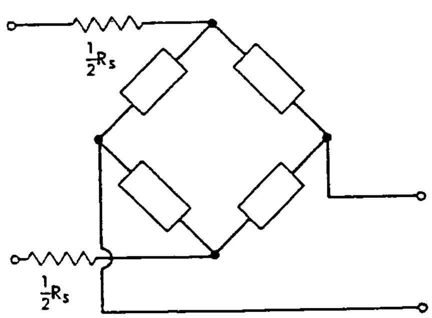

FIG. 11–12. Strain-gauge bridge with two compensation resistors.

FIG. 11–13. Schematic
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from which we find

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modulus, c, and electric
Table 6–1) and because

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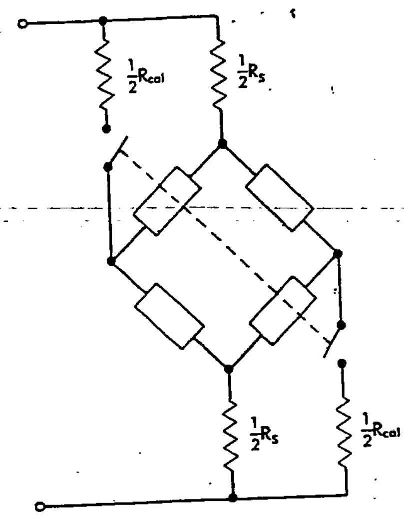


FIG. 11-13. Schematic diagram of a strain-gauge bridge showing how calibration may be accomplished.

from which we find

$$\frac{R_s}{R} = -\frac{c}{b+c}. \tag{11-10}$$

This indicates that temperature compensation may possibly be accomplished through proper balancing of the temperature coefficients of Young's modulus, c, and electrical resistivity, b. Because c is usually negative (see Table 6-1) and because the resistances cannot be negative, it follows that

$$b > -c.$$

In addition, we may write [See Eq. (5-2)]

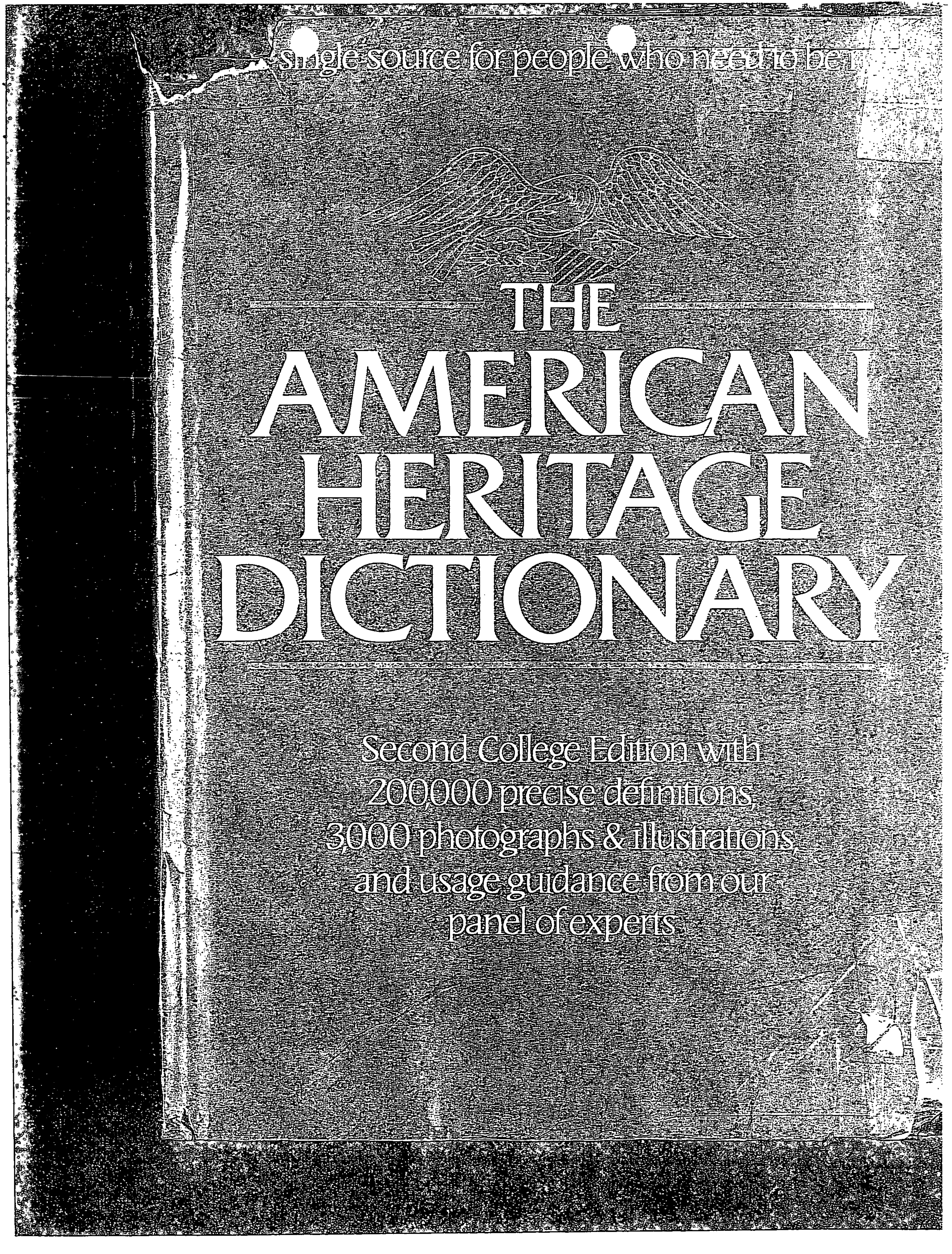
$$R_s = \rho\frac{L}{A} = -R\left(\frac{c}{b+c}\right), \tag{11-11}$$

from which

$$L = -\frac{RA}{\rho}\left(\frac{c}{b+c}\right). \tag{11-11a}$$

From these relations, specific requirements for compensation may be derived. After a resistance material, usually in the form of wire, is selected, the required length may be determined through use of Eq. (11-11a).

Although a single resistor would serve, commercial cells normally use two modulus resistors, as shown in Fig. 11-12. This assures proper connections regardless of instrumentation and also permits electrical calibra-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and usage guidance from our
panel of experts

gol. 2. **mongoloid.** Characterized by, affected with, or relating to Down's syndrome. —*n.* 1. *Anthropol.* A member of the Mongoloid ethnic division of the human species. 2. **mongoloid.** A person affected with Down's syndrome.

mon·goose (mŏng'go͞os', mŏn'-) *n., pl.* **-goos·es.** Any of various Old World carnivorous mammals of the genus *Herpestes* and related genera, having a slender body and a long tail and notable for being able to kill venomous snakes. [Marathi *mangūs,* of Dravidian orig.]

mon·grel (mŭng'grəl, mŏng'-) *n.* 1. An animal or plant, esp. a dog, resulting from various interbreedings. 2. A cross between two different breeds. —*adj.* Of mixed origin or character. [Prob. < ME *mong,* mixture < OE *(ge)mang.*] —**mon·grel'ism** *n.* —**mon'grel·ly** *adv.*

mon·grel·ize (mŭng'grə-līz', mŏng'-) *tr.v.* **-ized, -iz·ing, -iz·es.** To make mongrel in race, nature, or character. —**mon'grel·i·za'tion** *n.*

mon·ick·er (mŏn'ĭ-kər) *n.* Variant of **moniker.**

mon·ied (mŭn'ēd) *adj.* Variant of **moneyed.**

mon·ies (mŭn'ēz') *n.* A plural of **money.**

mon·i·ker or **mon·ick·er** (mŏn'ĭ-kər) *n. Slang.* A personal name or nickname. [Orig. unknown.]

mo·ni·li·a·sis (mō'nə-lī'ə-sĭs, mŏn'ə-) *n.* Candidiasis. [NLat. *Monilia,* fungus genus + -IASIS.]

mo·nil·i·form (mō-nĭl'ə-fôrm') *adj.* Resembling a string of beads, as various plant roots, the antennae of certain insects, and the nuclei of some members of the Ciliata. [Lat. *monile,* necklace + -FORM.] —**mo·nil'i·form'ly** *adv.*

mon·ish (mŏn'ĭsh) *tr.v.* **-ished, -ish·ing, -ish·es.** To admonish; warn. [ME *monesen* < OFr. *monester* < VLat. **monestare* < Lat. *monēre,* to warn.]

mo·nism (mō'nĭz'əm, mŏn'ĭz'əm) *n. Philos.* A metaphysical system in which reality is conceived as a unified whole. —**mo'nist** *n.* —**mo·nis'tic** (mō-nĭs'tĭk, mŏ-) *adj.* —**mo·nis'ti·cal·ly** *adv.*

mo·ni·tion (mō-nĭsh'ən, mə-) *n.* 1. A warning or intimation of impending danger. 2. **a.** An admonition. **b.** A piece of advice; counsel. 3. A formal order from a bishop or ecclesiastical court to refrain from a specified offense. [ME *monicion* < OFr. *monition* < Lat. *monitio* < *monēre,* to warn.]

mon·i·tor (mŏn'ĭ-tər) *n.* 1. One that admonishes, cautions, or reminds. 2. A pupil who assists a teacher in routine duties. 3. **a.** A device used to record or control a process or activity. **b.** A screen used to view or check the picture being picked up by a television camera. 4. An articulated device holding a rotating nozzle, used in mining and fire-fighting. 5. **a.** A heavily ironclad warship of the 19th century with a low, flat deck and one or more gun turrets. **b.** A modern warship designed for coastal bombardment. 6. Any of various tropical carnivorous lizards of the genus *Varanus,* ranging in length from several inches to ten feet. —*v.* **-tored, -tor·ing, -tors.** —*tr.* 1. To check (the transmission quality of a signal) by means of a receiver. 2. To test for radiation intensity. 3. To keep track of by or as if by an electronic device. 4. To check by means of a receiver for significant content. 5. To scrutinize or check systematically with a view to collecting certain specified categories of data. 6. To keep watch over; supervise: *monitor an examination.* 7. To direct as a monitor. —*intr.* To act as a monitor. [Lat. < *monēre,* to warn.]

mon·i·to·ri·al (mŏn'ĭ-tôr'ē-əl, -tōr'-) *adj.* Of, pertaining to, or performed by monitors. —**mon'i·to'ri·al·ly** *adv.*

mon·i·to·ry (mŏn'ĭ-tôr'ē, -tōr'ē) *adj.* Conveying an admonition or warning: *a monitory glance.* —*n., pl.* **-ries.** A letter of admonition. [Lat. *monitorius* < *monitor,* monitor.]

monk (mŭngk) *n.* A member of a religious brotherhood living in a monastery and devoted to a discipline prescribed by his order. [ME *munk* < OE *munuc* < LLat. *monachus* < LGk. *monakhos* < Gk., single < *monos.*]

monk·er·y (mŭng'kə-rē) *n., pl.* **-ies.** 1. Monastic life or practices. 2. Monks collectively. 3. A monastery.

mon·key (mŭng'kē) *n., pl.* **-keys.** 1. A member of the order Primates, excluding man; specifically, most long-tailed primates, including the Old and New World monkeys and the marmosets, and usually excluding the anthropoid apes and the lemurs, lorises, tree shrews, and tarsiers. 2. A mischievous, playful child or young person. 3. The iron block of a pile driver. 4. *Slang.* A person who is mocked, duped, or made to appear a fool. 5. *Slang.* Drug addiction, regarded as a burdensome affliction: *have a monkey on one's back.* —*v.* **-keyed, -key·ing, -keys.** —*intr. Informal.* 1. To play, fiddle, or tamper with something idly. 2. To behave in a mischievous or apish manner. —*tr.* To imitate or mimic; ape. [Prob. of LG orig.]

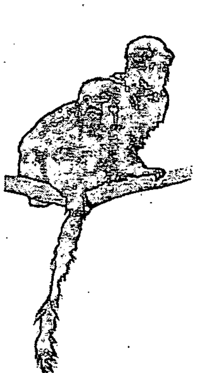
monkey bread *n.* The fruit of the baobab.

monkey business *n. Slang.* Silly, mischievous, or deceitful acts.

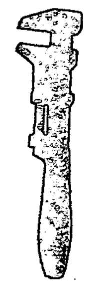
mon·key-flow·er (mŭng'kē-flou'ər) *n.* Any of various plants of the genus *Mimulus,* having variously colored, two-lipped flowers.

monkey jacket *n.* 1. A short, tight-fitting jacket, formerly worn by sailors. 2. A mess jacket.

monkey pot *n.* 1. **a.** The large, urn-shaped lidded pod of tropical trees of the genus *Lecythis.* **b.** A tree bearing this type of pod. 2. A cylindrical or barrel-shaped melting pot used in making flint glass.



monkey
Callimico goeldi



monkey wrench

monocle

monkey puzzle *n.* An evergreen tree, *Araucaria araucana,* native to Chile, having intricately ramifying branches covered with stiff, prickle-tipped leaves.

mon·key·shine (mŭng'kē-shīn') *n.* Often **monkeyshines.** *Slang.* A playful trick; prank.

monkey wrench *n.* 1. A hand tool with adjustable jaws for turning nuts of varying sizes. 2. *Informal.* Something that disrupts: *threw a monkey wrench into our plans.* [Orig. unknown.]

monk·fish (mŭngk'fĭsh') *n., pl.* **monkfish** or **-fish·es.** The goosefish. [From the cowled appearance of its head.]

Mon-Khmer (mōn'kmĕr') *n.* A subfamily of the Austro-Asiatic language family that includes Mon, Khmer and other languages of Southeast Asia.

monk·hood (mŭngk'ho͝od') *n.* 1. The state or profession of a monk; monasticism. 2. Monks collectively.

monk·ish (mŭng'kĭsh) *adj.* 1. Of, relating to, or characteristic of monks or monasticism. 2. Of or inclined to self-denial.

monk's cloth *n.* A heavy cotton cloth in a coarse basket weave.

monks·hood (mŭngks'ho͝od') *n.* Any of various usually poisonous plants of the genus *Aconitum,* having hooded flowers of various colors.

mon·o¹ (mŏn'ō) *n.* Mononucleosis (sense 2).

mon·o² (mŏn'ō) *adj.* Monaural (sense 2).

mono- or **mon-** *pref.* 1. One; single; alone: *monomorphic.* 2. Containing a single atom, radical, or group: *monobasic.* 3. Monomolecular; monatomic: *monolayer.* [ME < OFr. < Lat. < Gk. < *monos,* single, alone.]

mon·o·ac·id (mŏn'ō-ăs'ĭd) also **mon·o·a·cid·ic** (mŏn'ō-ə-sĭd'ĭk) *adj.* Having only one hydroxyl group to react with acids. —*n.* **monoacid.** An acid having one replaceable hydrogen atom.

mon·o·am·ine (mŏn'ō-ăm'ēn, -ə-mēn') *n.* An amine compound having one amino group.

monoamine oxidase *n.* An enzyme that acts as a catalyst in the oxidative deamination of monoamines.

mon·o·ba·sic (mŏn'ə-bā'sĭk) *adj.* 1. Monoprotic. 2. Having only one metal ion or positive radical.

mon·o·carp (mŏn'ə-kärp') *n.* A monocarpic plant.

mon·o·car·pel·lar·y (mŏn'ə-kär'pə-lĕr'ē) *adj.* Consisting of only one carpel.

mon·o·car·pic (mŏn'ə-kär'pĭk) also **mon·o·car·pous** (-kär'pəs) *adj.* Flowering and bearing fruit only once.

Mo·noc·er·os (mə-nŏs'ər-əs) *n.* 1. A constellation near Canis Major and Canis Minor. 2. **monoceros.** *Obs.* **a.** A one-horned fish, such as the swordfish. **b.** A unicorn. [ME, unicorn < OFr. < Lat. < Gk. *monokerōs,* having one horn : *monos,* one + *keras,* horn.]

mon·o·cha·si·um (mŏn'ə-kā'zē-əm, -zhē-əm) *n., pl.* **-si·a** (-zē-ə, -zhē-ə). A cyme having a single main stem. —**mon'o·cha'si·al** *adj.* [MONO- + (DI)CHASIUM.]

mon·o·chord (mŏn'ə-kôrd') *n. Mus.* An acoustical instrument consisting of a sounding box with one string and a movable bridge, used to study musical tones. [ME *monocorde* < OFr. < Med. Lat. *monochordum* < Gk. *monokhordon* : *monos,* one + *khordē,* string.]

mon·o·chro·mat·ic (mŏn'ə-krō-măt'ĭk) also **mon·o·chro·ic** (-krō'ĭk) *adj.* 1. Having only one color. 2. Having or producing light of only one wavelength. [Lat. *monochromatos* < Gk. *monokhrōmatos* : *monos,* one + *khrōma,* color.] —**mon'o·chro·mat'i·cal·ly** *adv.* —**mon'o·chro'ma·tic'i·ty** (-mə-tĭs'ĭ-tē) *n.*

mon·o·chrome (mŏn'ə-krōm') *n.* 1. A painting done in different shades of one color. 2. The technique of executing monochrome paintings. [Med. Lat. *monochroma* < Gk. *monokhrōmos,* of one color : *monos,* one + *khrōma,* color.] —**mon'o·chro'mic** (-krō'mĭk) *adj.*

mon·o·cle (mŏn'ə-kəl) *n.* An eyeglass for one eye. [Fr. < LLat. *monoculus,* having one eye : Gk. *monos,* one + Lat. *oculus,* eye.] —**mon'o·cled** (-kəld) *adj.*

mon·o·cline (mŏn'ə-klīn') *n.* A geologic formation in which all strata are inclined in the same direction. —**mon'o·cli'nal** *adj.*

mon·o·clin·ic (mŏn'ə-klĭn'ĭk) *adj.* Of or pertaining to three unequal crystal axes, two of which intersect obliquely and are perpendicular to the third.

mon·o·cli·nous (mŏn'ə-klī'nəs) *adj.* Having pistils and stamens in the same flower. [NLat. *monoclinus* : Gk. *monos,* one + Gk. *klinē,* couch.]

mon·o·coque (mŏn'ə-kōk', -kŏk') *n.* A metal structure, as of an aircraft, in which the covering absorbs a large part of the stresses to which the body is subjected. [Fr. : Gk. *monos,* one + *coque,* shell < Lat. *coccum,* berry < Gk. *kokkos.*]

mon·o·cot·y·le·don (mŏn'ə-kŏt'l-ēd'n) also **mon·o·cot** (mŏn'ə-kŏt') *n.* Any of various plants of the Monocotyledonae, one of the two major divisions of angiosperms, characterized by a single embryonic seed leaf that appears at germination. Included among the monocotyledons are such plants as grasses, orchids, and lilies. [NLat. *Monocotyledones,* class name : MONO- + Lat. *cotyledon,* navelwort. — see COTYLEDON.] —**mon'o·cot'y·le'don·ous** *adj.*

mo·noc·ra·cy (mō-nŏk'rə-sē, mə-) *n.* Government or rule by a single person; autocracy. —**mon'o·crat'** (mŏn'ə-krăt') *n.* —**mon'o·crat'ic** *adj.*

mo·noc·u·lar (mŏ-nŏk'yə-lər, mə-) *adj.* 1. Having or per-

taining to one eye. 2. Adapted for the use of only
[LLat. *monoculus,* having one eye. —see MONOCLE.
noc'u·lar·ly *adv.*

mon·o·cy·cle (mŏn'ə-sī'kəl) *n.* A unicycle.

mon·o·cyte (mŏn'ə-sīt') *n.* A large white blood co
having a pale, oval nucleus and more protoplasm
lymphocyte. —**mon'o·cyt'ic** (-sĭt'ĭk), **mon'o·cy'toi**
toid') *adj.*

mon·o·dac·tyl (mŏn'ə-dăk'tl) *n.* An animal having o
claw on each extremity. [< Gk. *monodaktulos,* hav
toe : *monos,* one + *daktulos,* toe.] —**mon'o·dac'ty·l**

mon·o·dra·ma (mŏn'ə-drä'mə, -drăm'ə) *n.* A dramat
position written for one performer. —**mon'o·dr**
(-drə-măt'ĭk) *adj.*

mon·o·dy (mŏn'ə-dē) *n., pl.* **-dies.** 1. An ode for one
actor, as in Greek drama. 2. An elegiac verse exp
personal lament. 3. *Mus.* **a.** A style of composition i
one vocal part or melodic line predominates. **b.** A co
tion in this style. [LLat. *monodia* < Gk. *monōidia* :
one + *oidē,* song.] —**mo·nod'ic** (mə-nŏd'ĭk), **mo·n**
adj. —**mo·nod'i·cal·ly** *adv.* —**mon'o·dist** (mŏn'ə-dĭst)

mo·noe·cious also **mo·ne·cious** (mə-nē'shəs) *adj.*
Having male and female reproductive organs in se
flowers on a single plant. 2. *Zool.* Hermaphroditic. [<
Monoecia, class name : Gk. *monos,* one + Gk. *oikia,*
—**mo·noe'cious·ly** *adv.*

mon·o·es·ter (mŏn'ō-ĕs'tər) *n.* An ester having on
group.

mo·nog·a·my (mə-nŏg'ə-mē) *n.* 1. The custom or co
of being married to only one person at a time. 2. The
tion of having one mate for life. —**mo·nog'a·mist** *n.*
nog'a·mous *adj.* —**mo·nog'a·mous·ly** *adv.*

mon·o·gen·e·sis (mŏn'ə-jĕn'ĭ-sĭs) *n.* 1. The theory t
living organisms are descended from a single cell. 2.
ual reproduction, as by sporulation. 3. The developm
an ovum into an organism resembling the parent, w
metamorphosis. —**mo·nog'e·nous** (mə-nŏj'ə-nəs) *adj.*

mon·o·ge·net·ic (mŏn'ə-jə-nĕt'ĭk) *adj.* 1. Pertaining
showing monogenesis. 2. Asexual. 3. Arising from a
formation process, as a mountain range.

mon·o·gen·ic (mŏn'ə-jĕn'ĭk) *adj.* 1. Having a comm
single origin, as igneous rocks composed of a single mi
2. **a.** Of or pertaining to monogenesis; monogenetic. **b**
taining to monogenism. 3. Of or regulated by one gene o
of a pair of allelic genes. 4. Producing offspring mos
one sex. —**mon'o·gen'i·cal·ly** *adv.*

mo·nog·e·nism (mə-nŏj'ə-nĭz'əm) *n.* The theory that
kind has descended from a single pair of ancestors. —
nog'e·nist *n.* —**mo·nog'e·nis'tic** *adj.*

mon·o·gram (mŏn'ə-grăm') *n.* A design composed of o
more letters, usually the initials of a name. —
-grammed, -gram·ming, -grams also **-gramed, -gram**
grams. To mark with a monogram. [LLat. *monogramm*
Gk. *monogrammon* : *monos,* single + *gramma,* letter <
phein, to write.] —**mon'o·gram·mat'ic** (-grə-măt'ĭk) *adj.*

mon·o·graph (mŏn'ə-grăf') *n.* A scholarly book, artic
pamphlet on a specific and usually limited subject. —
ograph' *v.* (**-graphed, -graph·ing, -graphs**). —**mo·no**
pher (mə-nŏg'rə-fər) *n.* —**mon'o·graph'ic** *adj.* —**m**
graph'i·cal·ly *adv.*

mo·nog·y·ny (mə-nŏj'ə-nē) *n.* The practice or conditio
having only one wife at a time. —**mo·nog'y·nist** *n.* —
nog'y·nous *adj.*

mon·o·hy·brid (mŏn'ō-hī'brĭd) *n.* Hybrid offspring of
ents differing in a single characteristic or genetic facto

mon·o·hy·drate (mŏn'ō-hī'drāt') *n.* A compound of si
hydrated molecules. —**mon'o·hy'drat'ed** *adj.*

mon·o·hy·dric (mŏn'ō-hī'drĭk) *adj.* Containing one repl
the hydroxyl radical.

mo·noi·cous (mə-noi'kəs) *adj.* Having archegonia and
theridia on the same plant; bisexual. [Alteration of
NOECIOUS.]

mon·o·lay·er (mŏn'ō-lā'ər) *n.* A film or stratum of a c
pound one molecule thick; monomolecular layer.

mon·o·lin·gual (mŏn'ə-lĭng'gwəl) *adj.* Using or know
only one language. —**mon'o·lin'gual** *n.*

mon·o·lith (mŏn'ə-lĭth') *n.* 1. A large block of stone,
one used in architecture or sculpture. 2. A large organi
tion, such as a corporation, that acts as a powerful unit. [
monolithe < Gk. *monolithos,* consisting of a single ston
monos, one + *lithos,* stone.]

mon·o·lith·ic (mŏn'ə-lĭth'ĭk) *adj.* 1. Consisting of a mo
lith. 2. Massive, solid, and uniform: *monolithic proporti*
—**mon'o·lith'i·cal·ly** *adv.*

mon·o·logue also **mon·o·log** (mŏn'ə-lôg', -lŏg') *n.* 1.
long speech made by one person, often monopolizing c
versation. 2. **a.** A dramatic soliloquy. **b.** A literary comp
tion in the form of a soliloquy. 3. A continuous series
jokes or comic stories delivered by a single comedian. [F
Gk. *monos,* one + Gk. *logos,* speech.] —**mon'o·log'ic** (mŏ
lŏj'ĭk), **mon'o·log'i·cal** *adj.* —**mo·nol'o·gist** (mə-nŏl'ə-j
mŏn'ə-lôg'ĭst, -lŏg'-) *n.*

mon·o·ma·ni·a (mŏn'ə-mā'nē-ə, -mān'yə) *n.* 1. Patholog
obsession with one idea. 2. Intent concentration on or ex
gerated enthusiasm for a subject or an idea. —**mon'o·ma'**
ac (-mā'nē-ăk') *n.* —**mon'o·ma·ni'a·cal** (-mə-nī'ə-kəl) *a*

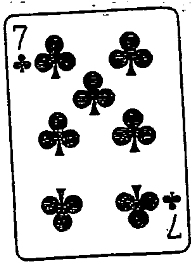
clove spice < OFr. *clou (de girofle)*, nail (of the clove tree) < Lat. *clavus*, nail.]
clove² (klōv) *n.* One of the small sections of a separable bulb, such as that of garlic. [ME < OE *clufu*.]
clove³ (klōv) *v.* A past tense and archaic past participle of **cleave¹**.
clove⁴ (klōv) *v. Archaic.* Past tense of **cleave²**.
clove hitch *n. Naut.* A knot used to secure a line to a spar, post, or other object, consisting of two turns with the second held under the first. [ME *clove*, split, p.part. of *cleven*, to split < OE *clēofan*.]
clo·ven (klō'vən) *v.* A past participle of **cleave¹**. —*adj.* Split; divided.
cloven foot *n.* A cloven hoof. —**clo'ven-foot'ed** *adj.*
cloven hoof *n.* **1.** A divided or cleft hoof, as in deer or cattle. **2.** Evil, based on the usual depiction of Satan as a figure with cloven hoofs.
clo·ven-hoofed (klō'vən-hŏŏft', -hōōft', -hŏŏvd', -hōōvd') *adj.* **1.** Having cloven hoofs, as cattle do. **2.** Satanic; devilish.
clove oil *n.* An aromatic oil distilled from the dried flower buds of the clove tree, used in medicine as an antiseptic.
clove pink *n.* A variety of the carnation, *Dianthus caryophyllus*, having flowers with a spicy fragrance.
clo·ver (klō'vər) *n.* **1.** A plant of the genus *Trifolium*, having compound leaves with three leaflets and tight heads of small flowers. Many species provide valuable pasturage. **2.** Any of several plants related to the clover, such as the bush clover. —*idiom.* **in clover.** Living a carefree life of ease, comfort, or prosperity. [ME < OE *clæfre*.]
clo·ver·leaf (klō'vər-lēf') *n.* A highway interchange at which two highways crossing each other on different levels are provided with curving access and exit ramps enabling vehicles to go in any of four directions.

cloverleaf

clown (kloun) *n.* **1.** A buffoon or jester who entertains by jokes, antics, and tricks in a circus, play, or other presentation. **2.** A coarse, rude, vulgar person; boor. **3.** A rustic or peasant. —*intr.v.* **clowned, clown·ing, clowns. 1.** To behave like a clown or buffoon. **2.** To perform as a jester or clown. [Perh. of LG orig.] —**clown'ish** *adj.* —**clown'ish·ly** *adv.* —**clown'ish·ness** *n.*
clox·a·cil·lin (klŏk'sə-sĭl'ĭn) *n.* A synthetic antibiotic of the penicillin group that is effective against staphylococci. [C(H)L(ORO)- + OX- + A(ZO) + (PENI)CILLIN.]
cloy (kloi) *v.* **cloyed, cloy·ing, cloys.** —*tr.* To supply with too much of something, esp. with something too rich or sweet; surfeit. —*intr.* To cause to feel surfeited. [Obs. *accloy* < ME *acloien*.] —**cloy'ing·ly** *adv.* —**cloy'ing·ness** *n.*
cloze (klōz) *n.* A test of reading comprehension in which the test taker is asked to supply words that have been systematically deleted from a text. [Alteration of CLOSURE.] —**cloze** *adj.*

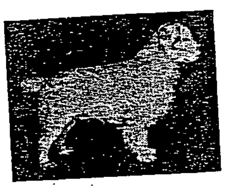
clown

club (klŭb) *n.* **1.** A stout, heavy stick, usually thicker at one end than at the other, suitable for use as a weapon; cudgel. **2.** A bat or stick used in certain games to drive a ball, esp. a stick with a curved head used in such games as golf and hockey. **3. a.** A black figure on a playing card, shaped like a trefoil or clover leaf. **b.** A card marked with such figures. **c. clubs.** The suit so marked. **4.** A group of people organized for a common purpose, esp. a group that meets regularly. **5.** The room, building, or other facilities used for the meetings of a club. —*modifier: club regulations.* —*v.* **clubbed, club·bing, clubs.** —*tr.* **1.** To strike or beat with or as if with a club. **2.** To use (a rifle or similar firearm) as a club by holding the barrel and hitting with the butt end. **3.** *Archaic.* To gather or combine (hair, for example) into a clublike mass. **4.** To contribute for a joint or common purpose. —*intr.* **1.** *Archaic.* To form or gather into a mass. **2.** To join or combine for a common purpose; form a club. [ME < ON *klubba*.]



club

club·ba·ble also **club·a·ble** (klŭb'ə-bəl) *adj. Informal.* Suited to membership in a social club; sociable.
club·by (klŭb'ē) *adj.* **-bi·er, -bi·est. 1.** Typical of a club or club members. **2.** Friendly; sociable. **3.** Clannish; exclusive. —**club'bi·ness** *n.*
club car *n.* A railroad passenger car equipped with lounge chairs, tables, a buffet or bar, and other extra comforts.
club chair *n.* An upholstered easy chair with arms and a low back.
club·foot (klŭb'fŏŏt') *n.* **1.** Congenital deformity of the foot, marked by a misshapen appearance often resembling a club. **2.** A foot so deformed. —**club'foot'ed** *adj.*
club·house (klŭb'hous') *n.* **1.** A building occupied by a club. **2.** The locker room for a sports team.
club·man (klŭb'mən, -măn') *n.* A man who is a member of a club or clubs, esp. one who is active in club life.
club moss *n.* Any of various evergreen, erect or creeping, mosslike plants of the genus *Lycopodium*, having tiny, scalelike, overlapping leaves and reproducing by spores. [From the club-shaped strobiles on some species of this plant.]
club root *n.* A disease of cabbage and related plants, caused by a fungus, *Plasmodiophora brassicae*, and resulting in large, distorted swellings on the roots.
club sandwich *n.* A sandwich, usually of three slices of bread, with a filling of various meats, tomato, lettuce, and dressing.



Clumber spaniel

Clydesdale

club soda *n.* An effervescent, unflavored water used in various alcoholic and nonalcoholic drinks.
club steak *n.* Delmonico steak.
club·wom·an (klŭb'wŏŏm'ən) *n.* A female member of a club or clubs, esp. one who is active in club life.
cluck (klŭk) *n.* **1. a.** The characteristic sound made by a hen when brooding or calling her chicks. **b.** A sound resembling a cluck. **2.** *Informal.* A stupid or foolish person. —*v.* **clucked, cluck·ing, clucks.** —*intr.* **1.** To utter a cluck. **2.** To make a sound similar to a cluck, as in coaxing a horse. —*tr.* **1.** To call by making a cluck. **2.** To express by clucking: *He clucked disapproval.* [Imit.]
clue also **clew** (klōō) —*n.* Something that guides or directs in the solution of a problem or mystery. —*tr.v.* **clued, clu·ing** or **clu·ing, clues** also **clewed, clew·ing, clews.** To give (someone) guiding information: *Clue me in on what's happening.* [Var. of CLEW (from Theseus' use of a thread as a guide through the Cretan labyrinth).]
Clum·ber spaniel also **clum·ber spaniel** (klŭm'bər) *n.* A dog of a breed developed in England, having short legs and a silky, predominantly white coat. [After *Clumber*, an estate in Nottinghamshire, England.]
clump (klŭmp) *n.* **1.** A clustered mass; lump. **2.** A thick grouping, as of trees or bushes. **3.** A heavy dull sound; thud. —*v.* **clumped, clump·ing, clumps.** —*intr.* **1.** To form clumps. **2.** To walk with a heavy dull sound. —*tr.* To gather into or form clumps of. [Prob. LG *klump* < MLG *klumpe*.] —**clump'y** *adj.*
clum·sy (klŭm'zē) *adj.* **-si·er, -si·est. 1.** Lacking physical coordination, skill, or grace; awkward. **2.** Awkwardly made; unwieldy: *clumsy wooden shoes.* **3.** Gauche; inept: *a clumsy excuse.* [< obs. *clumse*, to be numb with cold < ME *clomsen*, of ON orig.] —**clum'si·ly** *adv.* —**clum'si·ness** *n.*
clung (klŭng) *v.* Past tense and past participle of **cling.**
clunk (klŭngk) *n.* **1.** A dull sound; thump. **2.** A hefty blow. **3.** A stupid or dull person. —*v.* **clunked, clunk·ing, clunks.** —*intr.* **1.** To make or move with a clunk. **2.** To strike something with a clunk. —*tr.* To strike with a clunk. [Imit.]
clunk·er (clŭng'kər) *n.* **1.** A rattletrap, esp. an old car. **2.** A failure; flop.
clu·pe·id (klōō'pē-ĭd) *n.* Any of various oily, soft-finned fishes of the family Clupeidae, which includes the herrings and menhadens. —*adj.* Of or belonging to the Clupeidae. [NLat. *Clupeidae*, family name < Lat. *clupea*, a kind of small fish.]
clus·ter (klŭs'tər) *n.* **1.** A group of the same or similar elements gathered or occurring closely together; bunch. **2.** Two or more successive consonants in a word, as *cl* and *st* in the word *cluster*. —*v.* **-tered, -ter·ing, -ters.** —*intr.* To gather or grow into clusters. —*tr.* To cause to grow or form into clusters. [ME < OE *clyster*.]
cluster headache *n.* A severe headache similar to migraine that can occur several times daily for a period of weeks.
clutch¹ (klŭch) *v.* **clutched, clutch·ing, clutch·es.** —*tr.* **1.** To grasp and hold tightly. **2.** To seize or snatch. —*intr.* To attempt to grasp or seize: *clutch at the ring.* —*n.* **1.** A hand, claw, talon, or paw in the act of grasping. **2.** A tight grasp. **3.** Often **clutches.** Control or power: *the clutches of sin.* **4.** A device for gripping and holding. **5. a.** Any of various devices for engaging and disengaging two working parts of a shaft or of a shaft and a driving mechanism. **b.** The lever, pedal, or other apparatus that activates such a device. **6.** A tense or critical situation: *came through in the clutch.* [ME *clucchen*, var. of *clicchen* < OE *clyccan*.]
clutch² (klŭch) *n.* **1.** The number of eggs produced or incubated at one time. **2.** A brood of chickens. —*tr.v.* **clutched, clutch·ing, clutch·es.** To hatch (chicks). [Var. of dial. *cletch*, perh. < *cleck*, to hatch < ME *clekken* < ON *klekja*.]
clut·ter (klŭt'ər) *n.* **1.** A confused or disordered state or collection; jumble: *clutter in the attic.* **2.** A confused noise; clatter. —*v.* **-tered, -ter·ing, -ters.** —*tr.* To litter or pile in a disordered state: *cluttered up the garage with tools and boxes.* —*intr.* **1.** To run or move with bustle and confusion. **2.** To make a clatter. [Prob. < ME *cloteren*, to clot.]
Clydes·dale (klīdz'dāl') *n.* A large, powerful draft horse of a breed developed in the Clyde valley, Scotland.
clyp·e·ate (klĭp'ē-ĭt) also **clyp·e·at·ed** (-ā'tĭd) *adj.* **1.** Shaped like a round shield. **2.** Having a clypeus.
clyp·e·us (klĭp'ē-əs) *n., pl.* **-e·i** (-ē-ī'). *Biol.* A shieldlike structure, esp. a plate on the front of the head of an insect. [NLat. < Lat. *clipeus*, round shield.] —**clyp'e·al** *adj.*
clys·ter (klĭs'tər) *n. Med.* An enema. [ME *clister* < Lat. *clyster* < Gk. *klustēr*, clyster pipe < *kluzein*, to wash out.]
Cly·tem·nes·tra also **Cly·taem·nes·tra** (klī'təm-nĕs'trə) *n. Gk. Myth.* The wife of Agamemnon. [Lat. < Gk. *Klutaimnēstra*.]
Cm The symbol for the element curium.
cni·do·blast (nī'də-blăst') *n.* A modified interstitial cell of coelenterates that produces a nematocyst. [Gk. *knidē*, nettle + -BLAST.]
Co The symbol for the element cobalt.
co– *pref.* **1.** With; together; joint; jointly: *coeducation.* **2. a.** Partner or associate in an activity: *co-author.* **b.** Subordinate or assistant: *copilot.* **3.** To the same extent or degree: *coextend.* **4.** Complement of an angle: *cotangent.* [ME < Lat. < *com-*, com-.]

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TRANSMITTAL FORM (to be used for all correspondence after initial filing)	Application Number	09/733,352
	Filing Date	12/08/2000
	First Named Inventor	Bumgarner, Kirk P et al
	Art Unit	1731
	Examiner Name	Hoffman, John M
Total Number of Pages in This Submission	Attorney Docket Number	SP00-038

ENCLOSURES (*Check all that apply*)

- [x] Fee Transmittal Form
  - [ ] Fee Attached
- [ ] Amendment/Reply
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
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- [ ] Information Disclosure Statement
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- [ ] Appeal Communication to Board of Appeals and Interferences
- [x] Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- [ ] Proprietary Information
- [ ] Status Letter
- [ ] Other Enclosure(s) (please Identify below):

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	Corning Incorporated		
Signature	[signature]		
Printed name	Robert L. Carlson		
Date	March 28, 2005	Reg. No.	35,473

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Effective on 12/08/2004.
Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

FEE TRANSMITTAL
For FY 2005

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($)

Complete if Known	
Application Number	09/733,352
Filing Date	12/08/2000
First Named Inventor	Bumgarner, Kirk P et al
Examiner Name	Hoffman, John M
Art Unit	1731
Attorney Docket No.	SP00-038

METHOD OF PAYMENT (check all that apply)

☐ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): ____

☑ Deposit Account Deposit Account Number: 03-3325 Deposit Account Name: ____

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☑ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, **except for the filing fee**

☑ Charge any additional fee(s) or underpayments of fee(s) under 37 CFR 1.16 and 1.17 ☑ Credit any overpayments

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FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
Application Type	**Fee ($)**	**Small Entity Fee ($)**	**Fee ($)**	**Small Entity Fee ($)**	**Fee ($)**	**Small Entity Fee ($)**	**Fees Paid ($)**
Utility	300	150	500	250	200	100	
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	**Fee ($)**	**Small Entity Fee ($)**
Each claim over 20 (including Reissues)	50	25
Each independent claim over 3 (including Reissues)	200	100
Multiple dependent claims	360	180

Total Claims ____ - 20 or HP = **Extra Claims** ____ x **Fee ($)** ____ = **Fee Paid ($)** ____

HP = highest number of total claims paid for, if greater than 20.

Indep. Claims ____ - 3 or HP = **Extra Claims** ____ x **Fee ($)** ____ = **Fee Paid ($)** ____

HP = highest number of independent claims paid for, if greater than 3.

Multiple Dependent Claims
Fee ($) ____ **Fee Paid ($)** ____

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets ____ - 100 = **Extra Sheets** ____ / 50 = **Number of each additional 50 or fraction thereof** ____ (round **up** to a whole number) x **Fee ($)** ____ = **Fee Paid ($)** ____

4. OTHER FEE(S) **Fees Paid ($)**

Non-English Specification, $130 fee (no small entity discount) ____

Other (e.g., late filing surcharge): Brief in Support of Appeal 500.00

SUBMITTED BY

Signature	[signature]	Registration No. (Attorney/Agent) 35,473	Telephone 607 974-3502
Name (Print/Type)	Robert L. Carlson		Date March 28, 2005